J. New York Entomol. Soc. 100(1):182–184, 1992

DISPERSAL OF THE ERGOT FUNGUS *CLAVICEPS PURPUREA* BY THE LAUXANIID FLY *MINETTIA LUPULINA*

Insect visitors of diseased plants may be important in the dispersal of many plant pathogens, and their behavior may be important in the distribution of pathogens in plant populations (A'Brook, 1973; Burdon, 1987; DeNoog, 1988; Roche, pers. comm.). Just as not all insect visitors of flowers are effective pollinators (Schemske and Horvitz, 1984) it is possible that not all visitors of diseased plants are effective dispersers of pathogens. In this study I assess the ability of two insect visitors of the pathogen *Claviceps purpurea* (Fr.) Tul. (Clavicipitaceae) to disperse it to the host plant *Festuca arundinacea* Schreb. (Poaceae).

Although the ascomycetous fungus *Claviceps purpurea* is a well studied, polycyclic pathogen of many species of grasses (Loveless, 1971), the secondary dispersal vectors of this pathogen have not been previously well described. At the time of primary infection, the wind disperses ascospores after sclerotia germinate (Lutrell, 1980). Once ascospores successfully infect the ovaries of grasses, the fungus induces the grasses to produce a sweet liquid called honeydew in which conidia are formed. It has been noted that the honeydew is attractive to insects, and that the fungus is secondarily dispersed by flies and beetles (Mower and Hancock, 1975). I known of no study, however, that quantifies the dispersal abilities of the insect visitors of grasses infected by *C. purpurea.*

At the Mountain Lake Biological Station in western Virginia, I found that individuals of *F. arundinacea* that are infected by *C. purpurea* and producing honeydew are predominantly visited by two insects, a mycophagous fly, *Minettia lupulina* (F.) (Diptera: Lauxaniidae) and a mycophagous beetle, *Acylomus* sp. (Coleoptera: Phalacridae). Because healthy panicles of the grass do not produce nectar or other rewards, it is unknown what causes insects to disperse the pathogen to uninfected individuals.

The beetle visits the infected florets when honeydew is present and sclerotia are just beginning to form. The beetles lay eggs at that time (Lemon, unpubl. data). Beetle larvae develop within the sclerotia. During the early stages of sclerotia development, I found developing beetle larvae, obvious feeding damage, and frass. At the end of the growing season, I found pupae and adult beetles within mature sclerotia as well.

The purpose of this study was to determine if the beetles or flies could be responsible for secondary dispersal of the pathogen. I investigated whether or not these two species carried spores on their bodies, and if so whether or not they transferred viable spores from their bodies to the surrounding environment.

MATERIALS AND MÈTHODS

To assess whether the flies or beetles were carrying spores, 12 individuals of each insect were collected in the vicinity of infected florets of *F. arundinacea* during the time of honeydew production. To determine whether the flies were carrying spores

on their bodies and/or in their guts, four flies were selected and each placed in a separate sterile vial to which 1 ml of sterile distilled water was added and then shaken for 1 minute using a vortex shaker. The number of *C. purpurea* spores per ml of water was counted by using a hemacytometer. To assess whether spores were present in fly guts, the abdomens were pierced, contents were shaken for an additional minute, and the spores counted. Gut spore content was calculated as the difference in spore counts before and after piercing. The same procedure was used for beetles. Because no fungal spores were found on the first four beetles, the remaining eight were also surveyed.

Since spores were found on the first four flies, the remaining eight were used to determine whether or not the flies carried and deposited viable spores onto objects on which they landed. The eight live flies were kept in separate sterilized glass vials for twenty four hours where they walked about and defecated. After the removal of the flies, each vial was rinsed with one ml of sterile distilled water. The number of spores in the rinse water was counted by using a hemacytometer, and one drop of the rinse water was plated onto each of two potato dextrose agar plates to count resultant colonies. Voucher specimens of the beetle are deposited at the Florida State Collection of Arthropods, Gainesville.

RESULTS

None of the twelve beetles surveyed carried *C. purpurea* spores internally or externally. In contrast, of four flies, three carried spores of *C. purpurea* externally, and all carried spores internally. The four individuals had a mean of 5.1×10^5 spores/ml (SD 4.1×10^5 range 0–1.04×10^6) on their body, and 9.1×10^6 spores/ml (SD 2.4×10^6, range $5.3 \times 10^6 - 1.24 \times 10^7$) in their gut.

When kept in vials, the flies deposited a mean of 2.76×10^6 spores/ml on the vial walls (SD 2.75×10^6, range 0–8.0×10^6). Some of the deposited spores were viable. Plating of approximately 0.1 ml of the spore suspension on agar yielded a mean of 36.57 colonies/plate (SD 45.81, range 0–100). The number of spores/ml of solution was not correlated with the number of colonies that developed (Spearmans rank correlation: $r = 0.19$ $P < 0.33$).

DISCUSSION

At Mountain Lake, the fly, *M. lupulina* may be a spore dispersal vector for *C. purpurea,* but the mycophagic beetle, *Acylomus* sp. was not. This is unusual since the beetles, but not flies, were breeding in the fungus and, presumably, might be more specific to the fungus than are the flies. The flies carried spores on their body, and in their gut, and transferred the spores to their surroundings. It seems likely that flies transmit spores to receptive grass stigmas by touching them with their bodies or by defecating on them. It was not unusual for some florets on the panicle to be producing honeydew at the same time that other florets on the same panicle were producing stigmas. I observed flies walking around on grass panicles which were producing honeydew and receptive stigmas at the same time. It is likely that the severity of infection on an individual panicle is caused by flies visiting diseased florets and moving spores to healthy florets on the same panicle. I also observed flies moving from diseased panicles to different healthy panicles with receptive stigmas. Flies are

probably moving spores from diseased plants to healthy plants by landing on them when searching for spore-filled honeydew in the diseased plant population.—*Kathleen M. Lemon, The Nature Conservancy, 1815 North Lynn St., Arlington, Virginia 22209.*

ACKNOWLEDGMENTS

Thanks to Carol Horvitz, David Janos, and Helen Alexander who made useful comments on the manuscript. D. A. Grimaldi identified the fly and M. C. Thomas identified the beetle. This work was supported by the Pratt Predoctoral Fellowship from Mountain Lake Biological Station, University of Virginia, and by the Jerry Curtis Plant Sciences Scholarship from the Department of Biology of the University of Miami.

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J. New York Entomol. Soc. 100(1):184, 1992

A NEW HOMONYM IN THE MEZIRINAE (HEMIPTERA: ARADIDAE)

In 1967 I established a new genus, *Argocoris* Kormilev, for a new described species, *Argocoris grossi* Kormilev, from Queensland, Australia (Kormilev, 1967, Rec. S. Austral. Mus. 15:519). I have been advised that *Argocoris* Kormilev, 1967, is a junior homonym of *Argocoris* Mayr, 1864, Hemiptera: Pentatomidae (Verh. Zool. Bot. Ges., Wien, 14:905) which was created for *Argocoris redtenbacheri* Mayr, 1864.

To rectify this homonym, I therefore now propose the replacement name of *Pseudoargocoris* Kormilev, new generic name, for *Argocoris* Kormilev, 1967.—*Nicholas A. Kormilev, 211 Pasadena Avenue N., Apt. 312, St. Petersburg, Florida 33710.*

ACKNOWLEDGMENT

I thank Dr. R. C. Froeschner (Smithsonian Institution, Washington, D.C.) for bringing this situation to my attention.